UPDATE ON CALIFORNIA SEA LION CAPTURES AND SURVEYS IN PUGET SOUND, WASHINGTON

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INTRODUCTION

This report will update the surveys and capture efforts for California sea lions, *Zalophus californianus*, through May, 2001 in Puget Sound, Washington. Research on California sea lions in Puget Sound intensified after the 1985/86 season following investigations of sea lion predation on winter-run steelhead, *Oncorhynchus mykiss*, at the Hiram M. Chittenden Locks (Locks) in Seattle (e.g. see Gearin et al. 1986, 1988, 1989, Pfeifer, (1987), Pfeifer et al. (1989). Annual surveys have been conducted to record the distribution and abundance of California sea lions in Puget Sound since 1986. The surveys have been conducted by biologists with the Washington Department of Fish and Wildlife (WDF&W) and the National Marine Mammal Laboratory (NMML), using small fixed-winged aircraft, generally during April, when sea lion abundance is usually greatest in Puget Sound. Sea lion captures began in February 1989 in Shilshole Bay, a short distance from the Locks, in an effort to begin marking animals which were involved in preying on steelhead. During 1989, 39 different sea lions were captured and translocated to the outer Washington coast to test whether removing sea lions from the Locks area would result in reduced predation on steelhead (Jeffries et al. 1989). Many (29) of the sea lions translocated during 1989 returned to the Locks vicinity within several weeks and it was determined that such short distance translocation did not offer more than short term relief from predation. The following year, in 1990, six sea lions were translocated to southern California, a much longer distance, but 4 of the 6 returned to the Pacific Northwest, one in 30 days. Even though translocation did not appear to offer a permanent solution to the problems at the Locks, the benefits of capturing and permanently marking sea lions in the vicinity were apparent. The captured animals were tagged and permanently marked by branding, allowing researchers to compile long term re-sighting histories on individual animals. Re-sighting records were being logged from researchers from California to British Columbia of the animals captured near the Locks, and patterns of distribution, movements, migration and mortality were becoming more clear (Gearin et al. 1995, 1996). Beginning in 1995, some California sea lions were instrumented using VHF radio tags and satellite-linked time depth recorders allowing for large scale tracking of individuals. Capture and marking efforts continued in Puget Sound through 2001 in order to maintain a sample of marked sea lions near the Locks for the purposes of determining potentially problem animals.

MATERIALS AND METHODS

Aerial and vessel surveys

Aerial surveys have been conducted annually in Puget Sound to record the maximum or peak counts of California sea lions. Surveys are flown at 500-600 feet altitude in small fixed-winged aircraft such as Cessna 172, 185 or a DeHavilland Beaver. Aerial photographs are taken during the surveys and the slides are later projected onto a screen and animals are counted. The peak count surveys are generally conducted in late-March or early April because that usually corresponds to the timing of the maximum counts in the inland waters of Washington. Additional surveys have been conducted during other months for many years but this report will

only detail the maximum spring counts for Puget Sound. Vessel surveys have been conducted in Puget Sound frequently from 1986-2001 especially near Shilshole Bay and Everett, 2 areas of concentrated sea lion abundance. Vessel surveys are conducted using small vessels 16-24 feet long generally with 2 observers. More information on methodology of sea lion census and surveys is found in Gearin et al. 1986, 1988. We also report here on recent vessel and aerial surveys from the outer Washington coast from 1997-2001.

Capture and marking of California sea lions

Capture and marking of California sea lions was initiated in February 1989 at Shilshole Bay, Washington. Sea lions are captured using a floating haul-out type trap designed and built specifically for captures in Puget Sound (Jeffries et al. 1995, Gearin et al. 1996). An additional trap was built and deployed at Everett, Washington in 1996 to take advantage of a large haul-out aggregation in the area. After sea lions were captured, they were transferred into transfer cages aboard a 30 foot barge where they were handled. Sea lions were handled using a specially designed "squeeze cage" by which they could be physically restrained without injuring the animal. Captured sea lions were checked for molt and general condition, weighed, measured, tagged, branded and many were given an antibiotic injection of tetracycline. No sea lions were captured in 1991-1993 but sea lion capture efforts were resumed on an annual basis after the 1993/94 season.

RESULTS

Aerial and vessel surveys

The maximum peak counts for Puget Sound are shown in Table 1. These counts reflect the greatest number of sea lions counted in Puget Sound during that calender year unless otherwise noted. Maximum or peak counts of California sea lions from Puget Sound are generally conducted during the spring months of April through May, when maximum abundance usually occurs. Table 1 shows the maximum number of sea lions counted within Puget Sound from aerial or shore based surveys for the years 1979-2001. Puget Sound is defined as the inland waters of Washington from Admiralty Inlet south to the Nisqually Delta. Also included in these counts is Hood Canal, Port Gardner, Port Susan, Possession Sound and Saratoga Passage. The counts do not include the Strait of Juan de Fuca, or the outer Washington coast. Within this region, the largest sea lion aggregations are observed at Everett in Port Gardner. The number of animals at Everett averages about 80% of the total for all of the region during any given survey. There has been a declining trend in maximum sea lion abundance in Puget Sound since the record counts in 1995. The 1999 and 2000 counts were the lowest observed there since 1982. Even though the maximum peaks counts have been low during the last 3-4 years, this does not appear to be reflected in the relative abundance at Shilshole Bay which has remained fairly constant.

Table 1. Maximum (peak) counts of California sea lions in Puget Sound, Washington from 1979-2001.

Year	Maximum Puget Sound count
1979- May 3,-shore	108
1980	186
1981	no data
1982	140
1983	213
1984	320
1985	525
1986- April 1,- aerial	1,031
1987- April 17,-aerial	650
1988- March 30, shore	603
1989- April 10, aerial	345
1990-April 10, aerial	374
1991-April 19, aerial	334
1992-April 1, aerial	414
1993-1&2 April-aerial	528
1994-April 4, aerial	596
1995-April 21, aerial	1,234
1996-April 21, shore	981
1997- April 17-aerial	528
1998-April 20,-aerial	220
1999-April 13,-shore	328
2000-May 22,-aerial	177
2001-April 16,-shore	223

Counts from Washington outer coast

A new sea lion haul-out site was discovered during an aerial survey on 12 December 1997 on East Bodelteh Island near Cape Alava. Before this survey, sea lions were not known to haul-out on this island despite many years of survey effort in the area. Since the December 12th survey, surveys by the WDF&W and the NMML have attempted to repeatedly survey this site during the fall and winter when large numbers of sea lions have been counted. This phenomena may represent a shift in distribution of California sea lions from being concentrated more in the inland waters in Puget Sound to the outer coast over the last 4-5 years. The numbers counted on the outer coast, especially in 1999 are 4-5 times greater than the previous peak counts from Puget Sound from 1979-2001. Given these high numbers, the shift in distribution to the outer coast may also involve other sea lions moving from British Columbia waters and from California and Oregon. The fall and winter counts are shown in Table 2.

Table 2. Counts of California sea lions from the outer Washington Coast during the fall and winter from 1997-2000.

Date	Number counted
Dec. 12, 1997-aerial	988 (940 on East Bodelteh)
Oct. 4, 1998-vessel	322 (23 on East Bodelteh)
Nov. 3, 1998-vessel	1,200-all East Bodelteh
Jan. 5, 1999-vessel	66 (50 on East Bodelteh)
Sept. 14, 1999-vessel	2,266 (2,237 on East Bodelteh)
Oct. 5, 1999-vessel	2,765 (2,482 on East Bodelteh)
Oct. 18, 1999-vessel	3,649 (3,456 on East Bodelteh)
Nov. 2, 1999-vessel	5,138 -all East Bodelteh
Sept. 6, 2000-vessel	2,275 (2,230 on East Bodelteh)
Sept. 18, 2000-vessel	2,126-all East Bodelteh
Nov. 17, 2000-vessel	2,450-all East Bodelteh

Capture and marking of California sea lions 1989-2001

A total of 1,313 California sea lions have been captured in Puget Sound from 1989- May 31, 2001 (Table 3). This total includes 805 "new" sea lions which had not been previously captured and 508 "recaptures" or sea lions which had previously been captured and branded and tagged in Puget Sound. Most (1,235) of the captures of sea lions occurred at Shilshole Bay near the Ballard Locks. During November of 1997, 78 sea lions were captured at Everett, Washington.

Table 3. California sea lion captures in Puget Sound, Washington from February 1989 through May 8, 2001.

Season/Years	Brand numbers	Number new	Recaptures	Total
1988/89	1-39	39	17	56
1989/90	41-43	3	3	6
1993/94	44-46	3	1	4
1994/95	47-256	210	30	240
1995/96	257-321	64	51	115
1996/97	322-456	135	86	221
1997/98	457-573	117	85	202
1998/99	574-621	51	54	105
1999/2000	622-732	112	101	213
2000/2001	733-803	71	80	151
TOTALS	**1-803**	**805**	**508**	**1313**

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